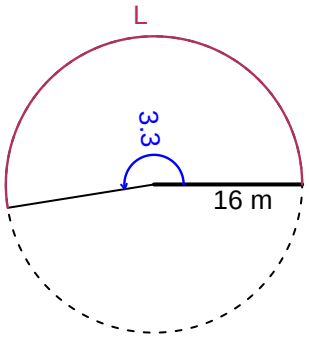
Name: Date:

Trig Final (Solution v15)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The angle measure is 3.3 radians. The radius is 16 meters. How long is the arc in meters?

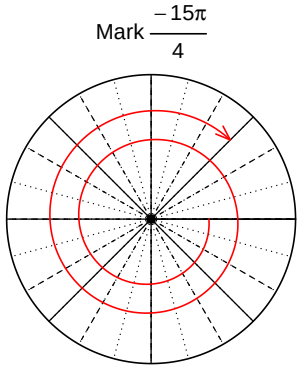


$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

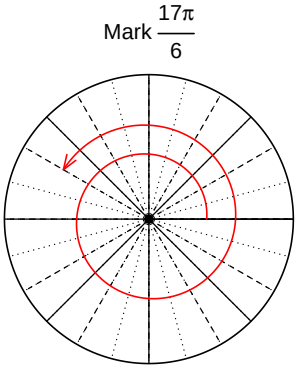
$L = 52.8$ meters.

Question 2

Consider angles $\frac{-15\pi}{4}$ and $\frac{17\pi}{6}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\cos\left(\frac{-15\pi}{4}\right)$ and $\sin\left(\frac{17\pi}{6}\right)$ by using a unit circle (provided separately).



Find $\cos(-15\pi/4)$



Find $\sin(17\pi/6)$

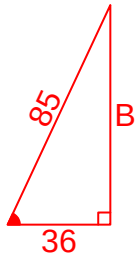
$\cos(-15\pi/4) = \frac{\sqrt{2}}{2}$

$\sin(17\pi/6) = \frac{1}{2}$

Question 3

If $\cos(\theta) = \frac{-36}{85}$, and θ is in quadrant III, determine an exact value for $\tan(\theta)$.

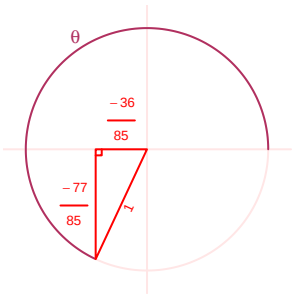
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$36^2 + B^2 = 85^2$$
$$B = \sqrt{85^2 - 36^2}$$
$$B = 77$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant III in a unit circle.



$$\tan(\theta) = \frac{\frac{-77}{85}}{\frac{-36}{85}} = \frac{77}{36}$$

Question 4

A mass-spring system oscillates vertically with a midline at $y = -2.65$ meters, a frequency of 6.9 Hz, and an amplitude of 4.56 meters. At $t = 0$, the mass is at the minimum height. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = -4.56\cos(2\pi 6.9t) - 2.65$$

or

$$y = -4.56\cos(13.8\pi t) - 2.65$$

or

$$y = -4.56\cos(43.35t) - 2.65$$